Engineering
N E

Western Engineering

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SAN FRANCISCO, NOVEMBER, 1917

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This Issue Contains

Concrete Highway Construction in Contra Costa County

General Safety Construction Orders of the California Industrial Accident Commission

The Sacramento By-Pass and Weir

Recent Bids on California State Highway Work

Economical Proportions for Portland Cement Mortars and Concretes

Drop in Pressure in Compressed-Air Hose

Chemistry

The Supply of Gasoline

Municipalities with City Managers

Absorption Method for Extracting Gasoline from Natural Gas

Effect of Sulphide Compounds on Cement

Methods of Removing Stumps

Spreading Flood-Waters in the Debris-Cone of the Santa Ana River

News Bulletin End of Reading Section

CONCRETE that shows a compressive strength exceeding 4000 pounds per square inch at 28 days is one of the reasons for the excellent results obtained in constructing the Contra Costa County highway system. Special attention is paid to obtaining a firm subgrade. No asphaltic surfacing is employed and the use of expansion joints has been abandoned. A description appears in this issue.

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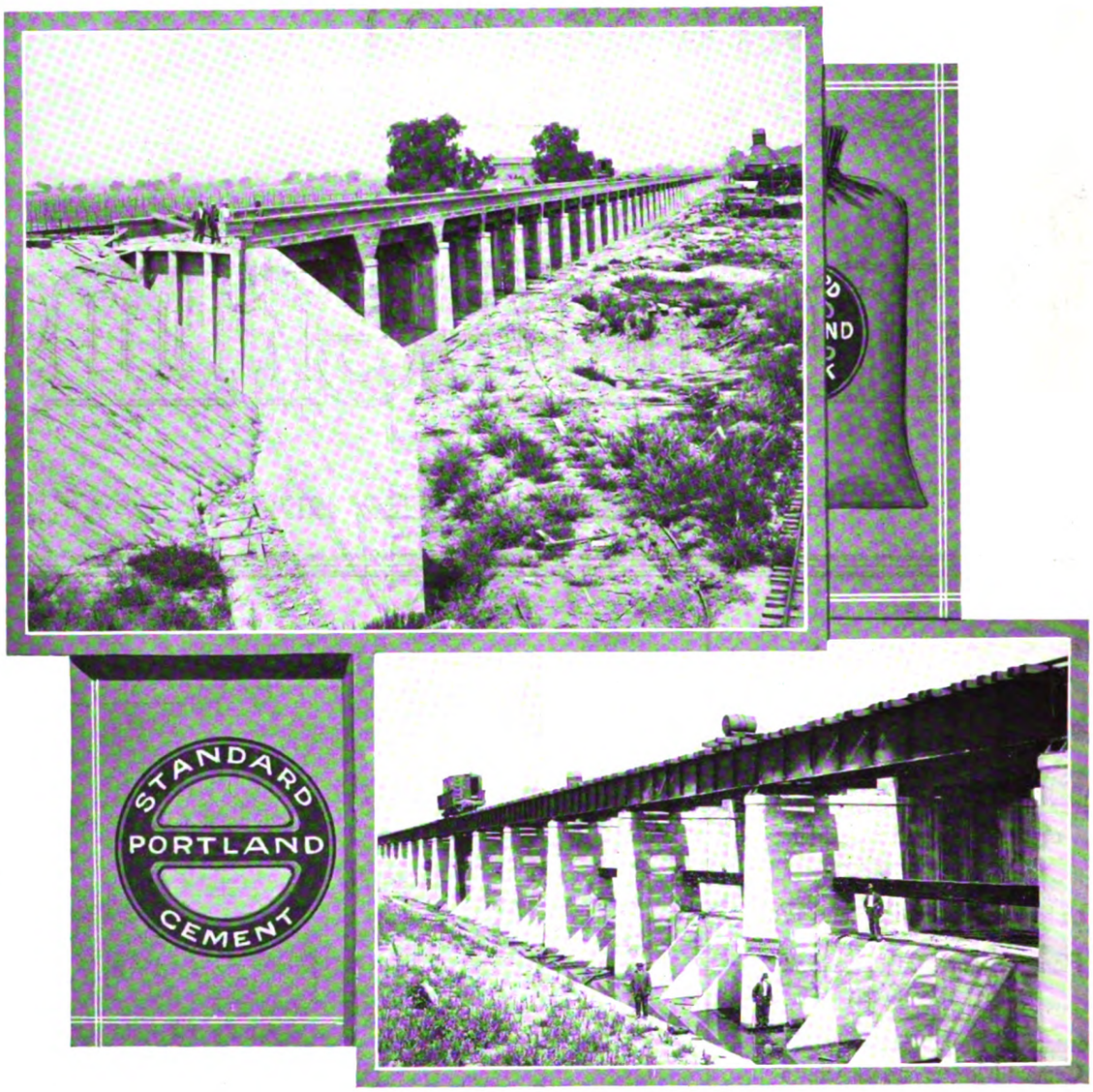

Reinforced-Concrete Combination Weir, Highway-Bridge and Railway-Bridge on West Bank of Sacramento River in Yolo County

Constructed for the City of Sacramento by Teichert & Ambrose. Designed by Frank C. Miller, City Engineer.

STANDARD PORTLAND CEMENT

USED EXCLUSIVELY

"Concrete for Permanence"

Standard Portland Cement Corporation

CROCKER BUILDING SAN FRANCISCO

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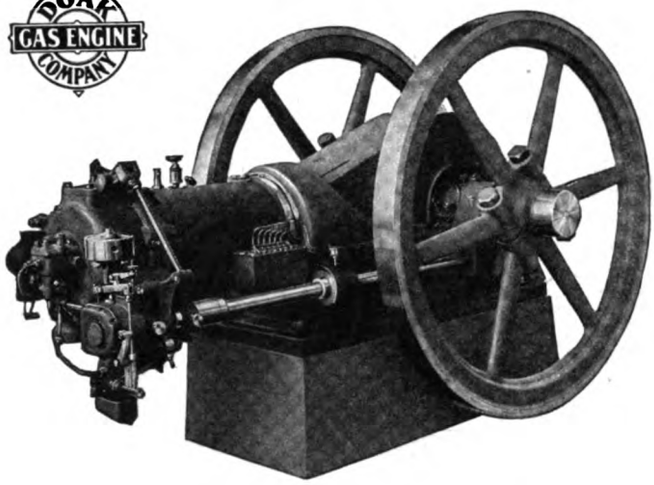

THE

DOAK Oil Engine

Is of the four-cycle, surface-ignition type. Built with both horizontal and vertical cylinders.

Operates successfully on any asphalt base oil which the Deisel engine can handle and with a fuel economy only a trifle less.

Is free from carbon troubles, asphaltic deposits and pre-ignition, because of the patented double fuel spray.

Has no smoky exhaust—the combustion is complete.

Is manufactured in sizes from 35 to 240 H.P.

Is economical and simple to operate, absolutely reliable and built for continuous operation.

Is *not* an experiment—is in use in all parts of the world —many months successful continuous operation on 18° Baume California fuel oil proves complete adaptability to asphalt oils.

YOUR CORRESPONDENCE IS SOLICITED

Doak Gas Engine Company

803 CUNARD BUILDING **SAN FRANCISCO**

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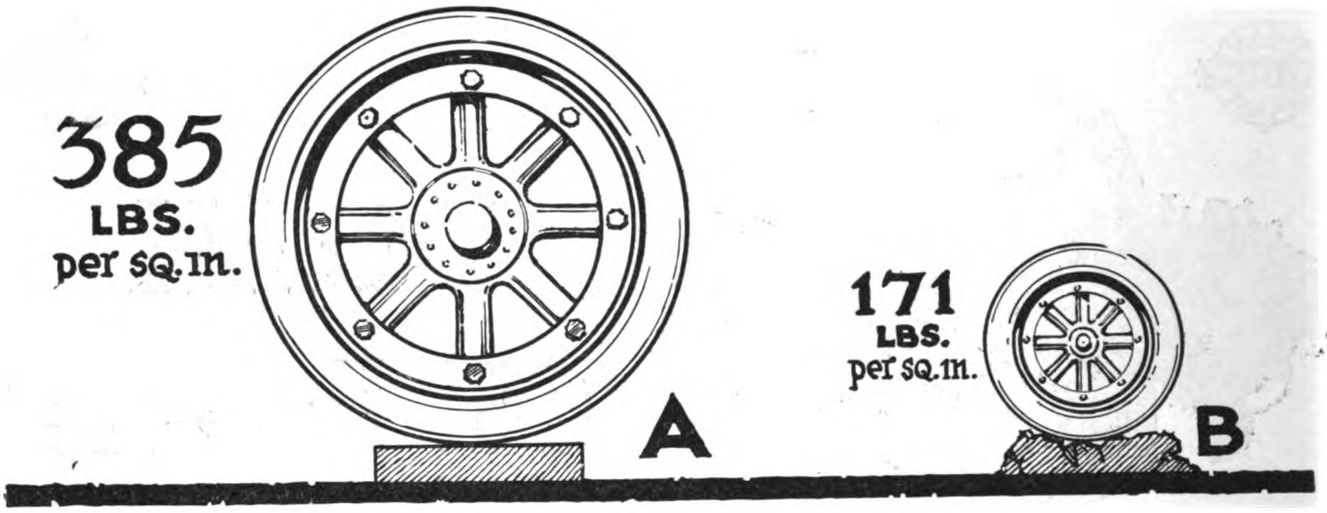


BRIQUETTE A was made of earth with "E" grade asphaltum binder.

Briquette B was made with road oil containing 95% of asphaltum.

Briquette A withstood pressure up to 386 pounds per square inch.

Briquette B was crushed at 171 pounds per square inch.

Other briquettes of road oil containing lesser proportions of asphaltum were crushed at lower pressures, varying directly with the percentage of asphaltum contained in the road oil.

The road builder's battle is with the forces of traffic—impact and weight. The tests just outlined—made recently in the laboratories of the Standard Oil Company—show that the higher the percentage of asphaltum in asphaltic binder, the greater its value in road construction.

In fact, these tests show that ***asphaltum*** offers many times greater resistance to the forces of traffic and the elements than road oil containing only a percentage of asphaltum.

Engineers are recognizing this fact, with the result that better and more permanent results in road building are in evidence.

Calol Asphaltum

("E" Grade)

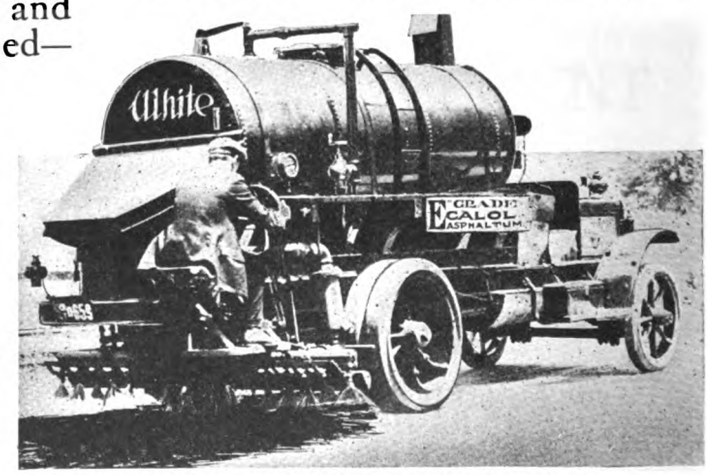
prevents the disintegration and displacement of the mineral aggregate under the forces of traffic; waterproofs the road and prevents the disintegration and softening due to the infiltration of water. And it is always uniform, insuring uniformly good results.

Shipped in tank cars equipped with steam coils for unloading purposes, and also in wood barrels.

Standard Oil Company

(CALIFORNIA)

Standard Oil Building San Francisco, Cal.



Power Pressure Sprinkler equipped with heating device to keep asphaltum hot while in transit.

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The Grand Prize

was awarded by The Panama-Pacific International Exposition for "Armco" Iron, for five Special Characteristics. Prominent among these are Chemical Purity and Rust-Resistance.

The Gold Medal

was awarded to

The "Armco" Iron Flume

Among metal flumes this is the recognized standard in respect to ***material*** and ***construction.*** On hundreds of great irrigation and power developments and for thousands of individual land owners it is giving perfect service.

Write or phone the Nearest Manufacturer for full information as to Rust-Resisting "Armco" Iron Flumes, Culverts, Irrigation Gates, Signs, Sheets, Roofing and Formed Products.

California, Los Angeles
California Corrugated Culvert Co.

California, West Berkeley
California Corrugated Culvert Co.

Colorado, Denver
R. Hardesty Mfg. Co.

Montana, Missoula
Coast Culvert & Flume Co.

Nebraska, Wahoo
Nebraska Culvert & Mfg. Co.

Ohio, Middletown
The Ohio Corrugated Culvert Co.
American Rolling Mill Co.

Oregon, Portland
Coast Culvert & Flume Co.

South Dakota, Sioux Falls
Sioux Falls Metal Culvert Co.

Texas, Houston
Lone Star Culvert Co.

Texas, El Paso
Western Metal Mfg. Co.

Utah, Woods Cross
Utah Corrugated Culvert & Flume Co.

Washington, Spokane
Coast Culvert & Flume Co.

CANADA—Canada Ingot Iron Co., Ltd., Guelph, Sherbrooke, Winnipeg, Calgary.

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Call to the Colors with the United States Army in France

To Experienced Operators of—

AUSTIN

MOTOR ROLLERS
GYRATORY CRUSHERS
ELEVATING GRADERS
ROAD MACHINERY

Uncle Sam is shipping Sixty Austin Motor Rollers and a big lot of Austin Crushers, Graders and other machinery to France with probably much more to follow.

He wants experienced men to operate these machines and offers most attractive inducements. Forty to ninety-six dollars per month and expenses.

A chance for sound men of young or middle age to serve their country building roads as Officers in the United States Army. There are many thousands of such men in America.

Here is Your Opportunity
Duty, Honor and Glory All Call You
Don't Miss It

Fill out and mail coupon below or send for particulars to

AUSTIN MANUFACTURING COMPANY
CHICAGO

Commanding Officer, 23rd Engineers, National Army
1914 F Street, Washington, D. C.

(1) Name..... (2) Address.....
(3) Age ..... (4) Nationality.....
(5) Married or single..... (6) Have you been called in the draft?.....
(7) Will you enlist for period of the War.....
(8) State briefly your road-building or other construction experience.....
.....
(9) What machinery can you operate?.....
(10) Your present or a former employer must certify to your qualifications by signing here .....
.....

Signature of employer ..... Employer's address for telegrams .....

(Austin Mfg. Co. advertisement in Western Engineering. November, 1917)

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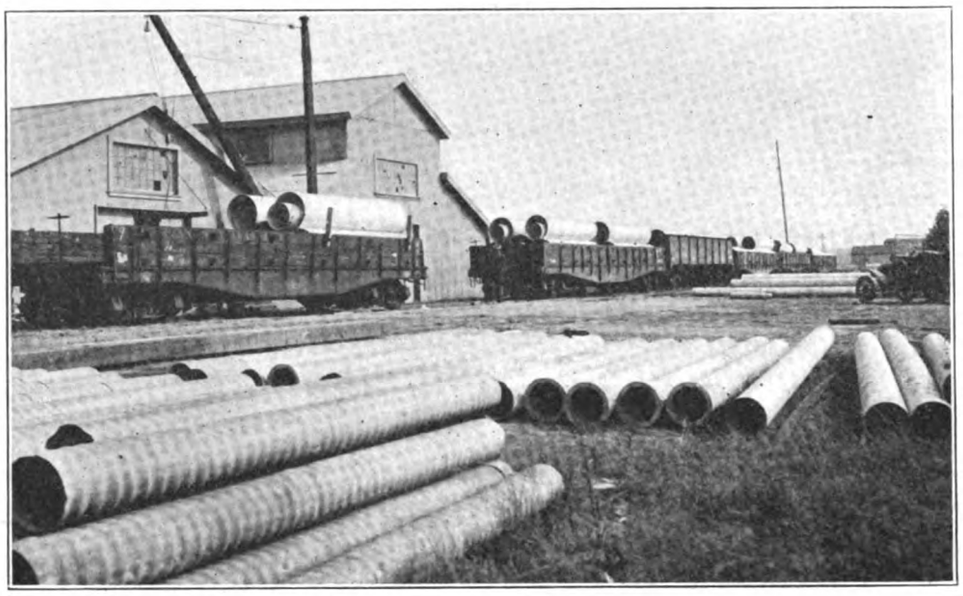

American Culverts

ready for shipment to be used on Western Pacific Railroad construction

CORROSION PROOF

When purchasing Corrugated Metal Culverts, demand the culvert with the proper amount of "COPPER *content.*" They will last 25 to 50% longer than culverts that do not contain COPPER. Actual service tests bear out this statement.

Leading Engineers and purchasing agents are specifying culverts with the COPPER content from .2 to .3 of 1%, because their lasting qualities are far superior.

AMERICAN CULVERTS are manufactured from GENUINE OPEN HEARTH IRON and Kentucky Copper Metal and are guaranteed forty years in service.

Write Us for Prices and Discounts on Corrugated Culverts, Arches, Irrigation and Flood Gates

American Corrugated Culvert Co.

600 I. W. Hellman Bldg.
Los Angeles, Cal.

531 Ochsmer Bldg.
Sacramento, Cal.

716-717 Hobart Bldg.
San Francisco

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Pumping Oil By Air

Do your oil wells contain more water than can be handled on the beam?

Are you experiencing difficulty due to so much sand and shale that the pump must be pulled too often?

Do your pumps work poorly because of the presence of too much gas?

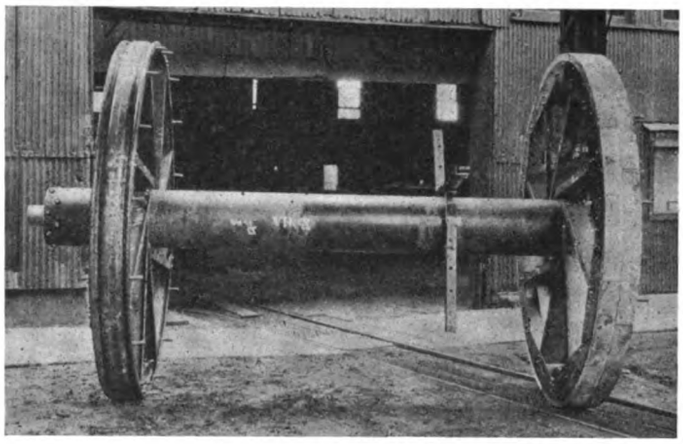
The Installation of an Ingersoll-Rand Air Lift
to do your pumping will prove a profitable investment
LET US TELL YOU HOW *CATALOGUE 76*

INGERSOLL-RAND COMPANY

11 Broadway NEW YORK **1036 Union Oil Bldg. LOS ANGELES** **Rialto Building SAN FRANCISCO**

112-M

Steel for Service



Steel Bull Wheel with Steel Tug Rim

ready for shipment from the mill.

This newest type of wheel has been thoroughly tested in the field and proven itself so efficient that we recommend it to users who wish the best.

Carnegie Steel Company

General Offices—Pittsburgh, Pa.

Address communications to

United States Steel Products Company

San Francisco, California **Los Angeles, California**

782

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Every unit contributes to its remarkable performance

The Tiffin 2-Motor-System Combination Flusher and Sprinkler is the only machine of this type that is *manufactured* in its entirety.

Single motor flushing machines, where the same motor must propel the vehicle and also provide flushing pressure, have all failed in the work intended.

Prompted by the phenomenal success of the Tiffin, assembling concerns have attempted to patch together two motor system machines.

These latter have also failed for the reason that the work is too exacting to be accomplished by any such hit or miss methods.

And so you will find the Tiffin Flusher still stands supreme in its field.

It accomplishes more and better work at a lower operating expense.

The Tiffin has as a foundation a perfectly built Tiffin Truck of tremendous strength and durability.

The Flushing and Sprinkling Apparatus, with its own independent motor, is scientifically built into the vehicle proper.

No other machine permits of such exact control, giving any desired flushing pressure regardless of vehicle speed.

Since there are self-starters for both motors, one man controls all devices and drives the vehicle.

Cities contemplating flusher equipment should ask for our engineering data covering street cleaning problems.

TIFFIN

2-Motor System Street Flusher

Designed by this Company and equipped with adjustable nozzles, which are licensed under Ottofy Patent No. 795059

THE TIFFIN WAGON COMPANY

TIFFIN, OHIO

Builders, also, of Tiffin Motor Trucks, Dumping and Farm Wagons, Etc.

REPRESENTATIVES:

NEW YORK—J. A. del Solar, Export
J. A. Dewey, Domestic
PHILADELPHIA—Loder & Smith
PITTSBURGH—H. B. Naylor
JACKSON, Mich.—G. M. Whaley
MINNEAPOLIS—J. N. Johnson Co.
WAUSAU, Wis.—Radcliffe Mchy. Co.
FARGO—Fargo Fire Engine Co.
OGDEN—Sidney Stevens Imp. Co.
DENVER—S. G. Elbe
LOS ANGELES—F. F. Foster Co.
SAN FRANCISCO—N. K. Davis
PORTLAND, Ore.—A. G. Long
MEMPHIS—J. G. Livar
NASHVILLE—Dixie Road Mchy. Co.
NORFOLK, Va.—W. M. Hannan, Jr.
MONTREAL—F. H. Hopkins & Co.
TORONTO—F. H. Hopkins & Co.

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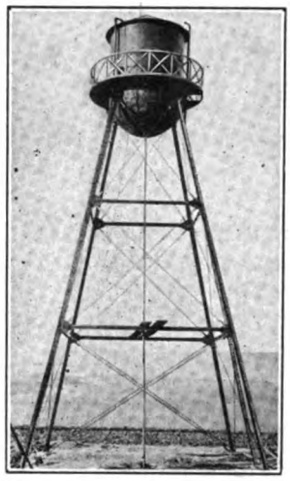


STEEL TANKS

For Every Purpose

OIL OR WATER STORAGE, RECTANGULAR, CYLINDRICAL OR HEMISPHERICAL, ELEVATED TANKS FOR MUNICIPAL RAILROAD OR INDUSTRIAL SERVICE.

SPECIFY **WESTERN** OF COURSE

The favorable location of our three factories not only enables us to make prompt shipments, but also reduces the first cost through a reduction in the freight. Your order will be executed at the factory from which the best rates can be secured.

Western Pipe & Steel Company
OF CALIFORNIA

444 Market Street, San Francisco 1758 N. Broadway, Los Angeles
BAKERSFIELD TAFT FRESNO STOCKTON SACRAMENTO
Factories at Richmond, Taft and Los Angeles

WESTERN PIPE & STEEL CO. OF CALIFORNIA

Right in the Heart of the Work

With a

"Big —an— Litle"

You can place the "Big-an-Litle" right where you want it. It's light and can be gotten many places where you would not think of putting any other mixer.

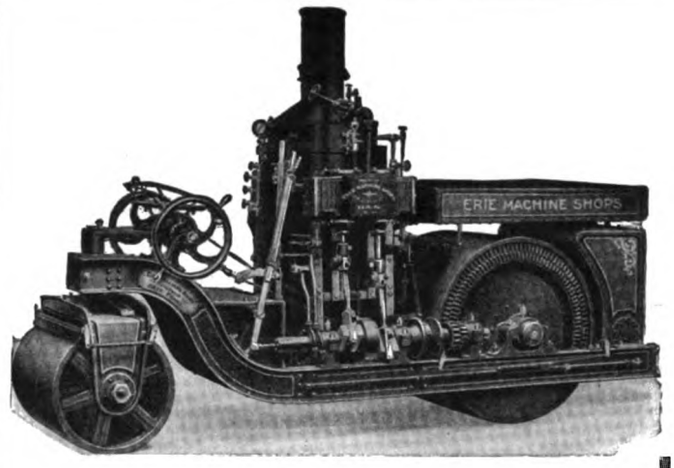
The "Big-an-Litle" is not a high-priced mixer but it is high in good results. It saves long wheeling—saves your men's time and energy and cuts down the number required, resulting in profit to you.

Lest You Forget, Send for the "Mix a Minute" Catalog NOW

Jaeger Machine Company, COLUMBUS OHIO

Represented by

EDWARD R. BACON COMPANY
51 Minna St., San Francisco
350 Merrick St., Los Angeles



Service you can not beat

The first ERIE Tandem Roller built in 1888 is still in active service doing first class work and, we are advised by the owners, is good for many more years of hard service. That is certainly unbeatable service and the best that money can buy.

ERIE MACHINE SHOPS, ERIE, PA.

Represented by

EDWARD R. BACON COMPANY
51 Minna St., San Francisco
350 Merrick St., Los Angeles

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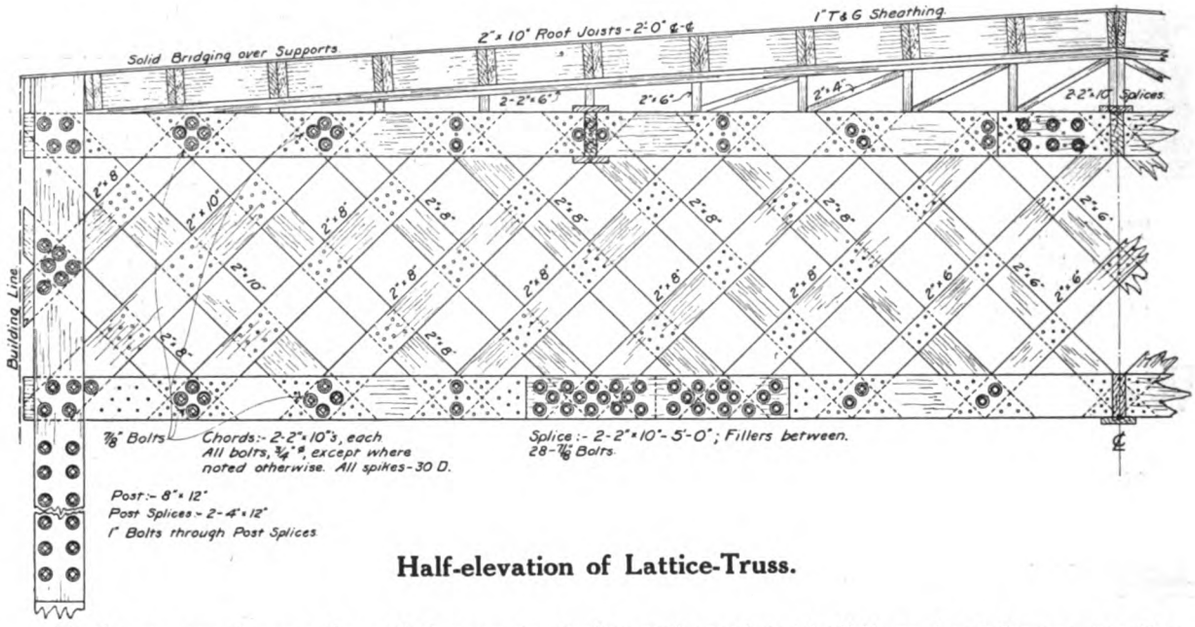
'TIMBER FRAMING'

By H. D. DEWELL, C. E.

275 PAGES, FULLY ILLUSTRATED. PRICE POSTPAID, $2

This book, just completed by one of the foremost structural engineers and designers, covers the subject of Timber Framing completely for the first time.



Half-elevation of Lattice-Truss.

Engineers are frequently called upon to design and construct buildings, head-frames, trestles, flumes, and other structures requiring heavy timber-framing. It is desirable that the structures be as simple in design as possible, while meeting the demand for safety and efficiency. There is a very common lack of the appreciation of the strength of timber-structures properly framed, and this results in much unnecessary expense and waste of materials by building a structure in which the timbers are of far greater size than the condition demands. By knowing how, the designer builds neither too expensively, nor is his structure weak. It is for the determination of these questions that 'Timber Framing' will be of great value.

THIS BOOK CONTAINS: Rules for Grading Lumber. Unit Stresses of Tension, Compression, Shear, and Bending. Co-ordination of Tests. Truss Detail and End Connections. Nailed, Screwed, and Bolted Joints. Intermediate Joints and Tension Splices. Foundation, Columns, and Connections. Design and Construction of Head-frames, Flumes, Ore-bins, and Mill Buildings. Specifications for Timber Framing.

The Only Modern Timber Framing Book Published

For a limited time 'Timber Framing' will be sent in combination with a year's subscription to Western Engineering, either on new subscriptions or renewals, for $2.50. Use the coupon.

Special Offer Coupon

WESTERN ENGINEERING, 420 Market St., San Francisco 5

.....ENTER my subscription to Western Engineering beginning with the current issue.

.....RENEW my subscription to Western Engineering at the expiration of my present subscription. Also send the new book 'Timber Framing,' by H. D. Dewell. For this I enclose $2.50, to be divided as follows: $1.50 for Western Engineering and $1.00 for the book.

Name ..... Vocation.....

Address ..... Employed by.....

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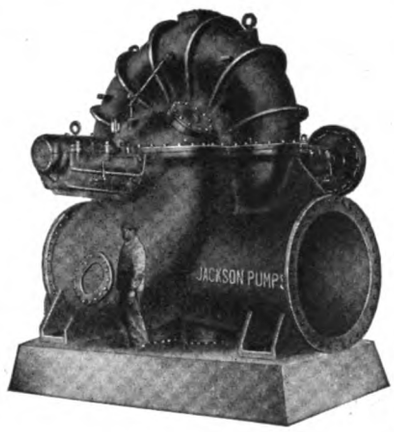
Indestructible Hose

THIS HOSE differs from that made in the usual way, in that there is placed between the layers of cotton duck and the external rubber a woven covering which prevents the expansion and elongation that, under pressure, takes place in all hose made in the ordinary way. This gives longer life, greater flexibility, no kinking.

Air Brake Hose	**Air Drill Hose**
Steam Hose	**Brewers' Hose**
Acid Hose	**Water Hose**
Pneumatic Tool Hose	**Fire Hose**

New York Belting & Packing Co., Ltd.
519 Mission Street, San Francisco

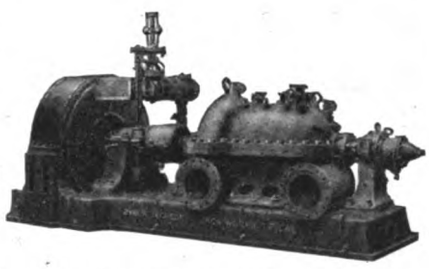


Centrifugal AND Turbine Pumps

FOR
IRRIGATION
RECLAMATION
MINES
WATER WORKS
BOILER FEED
SUGAR MILLS
SAND AND GRAVEL

Capacities: 10 to 100,000 gallons per minute, any head.

We shall be more than pleased to furnish preliminary estimates for any type of pumping plant.



BYRON JACKSON IRON WORKS, Inc.
SAN FRANCISCO
Write for Catalogue No. 30

SULLIVAN

Water Boosters

combine the following important advantages for water systems consisting of scattered wells:

(1) Pump water horizontally or to an elevation by the air lift without installing separate pumps or gravity tanks.

(2) Use the same compressed air for this work that has already been used to lift water to the surface.

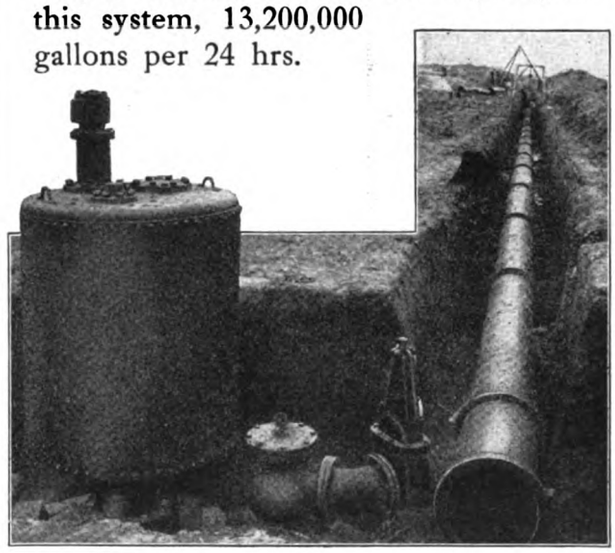
(3) Two or more wells, with separate boosters, may be handled by a common discharge line.

(4) System is entirely automatic.

Ask for details

Bulletin 3171-C

The cut shows one of a string of 10 wells and Sullivan Boosters, 350 ft. apart, installed recently for the United Furnace Co., at Canton, Ohio. Total capacity of this system, 13,200,000 gallons per 24 hrs.



Sullivan Machinery Co.

582 Market Street
San Francisco

122 S. Michigan Ave.
Chicago

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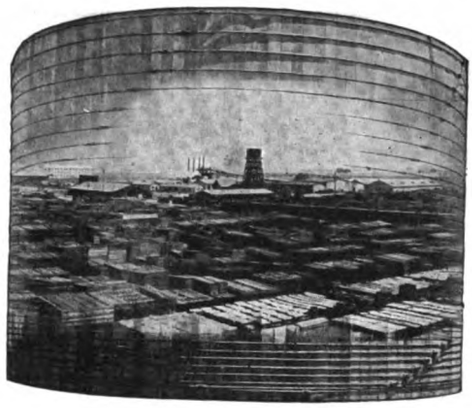


REMCO for Mechanical Perfection

SPECIALIZATION

in the design and manufacture of just two products for 28 years has taught us that so far as TANKS and PIPE are concerned

Redwood

is the material to use, AIR-DRIED of course, and that the large stock we keep constantly on hand—forty million feet or more—insures perfectly seasoned material.

Redwood,

when used in accordance with the above conditions, is acid and alkaline solution proof, immune from insect attack, rot, decay, extremes of heat and cold, while at the same time, it is fire-resisting to a marked degree.

The Costliest

and most efficient mechanical equipment, in the hands of the most skilled operatives, turns out the finished product from this material.

When you see the word "REMCO" applied to tanks and pipe, this is what it means.

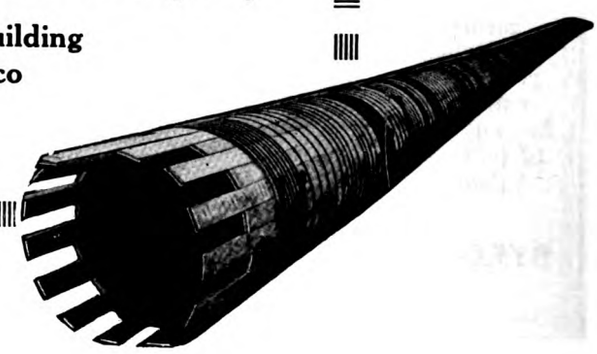
Many buyers have learned that REMCO is, in itself, a specification calling for the highest quality of material and workmanship.

LET US HELP YOU PLAN YOUR INSTALLATION.

WRITE

Redwood Manufacturers Company

1621 Hobart Building
San Francisco



Redwood for Durability

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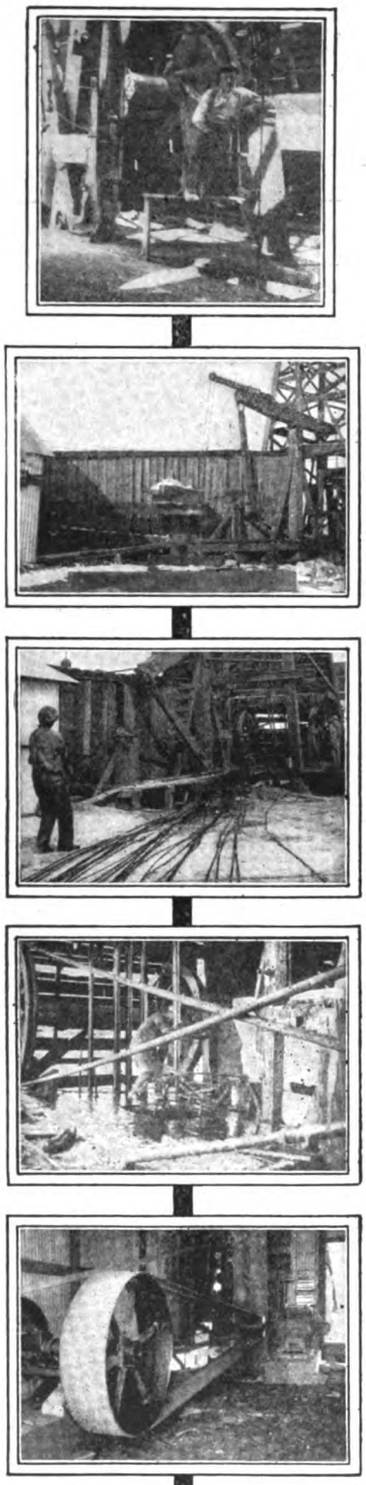

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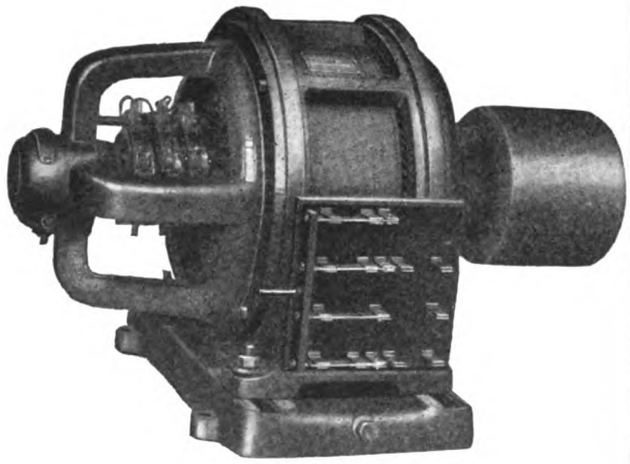

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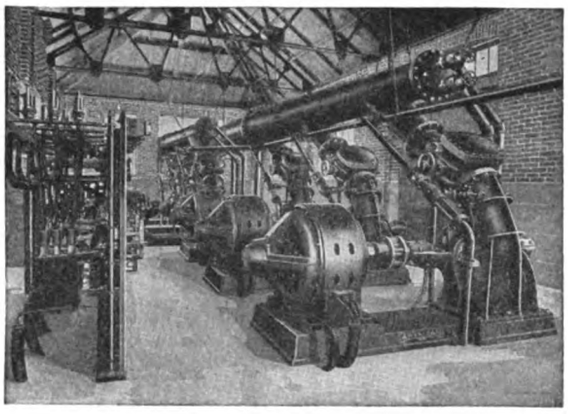

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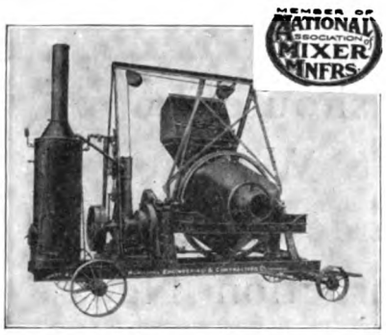

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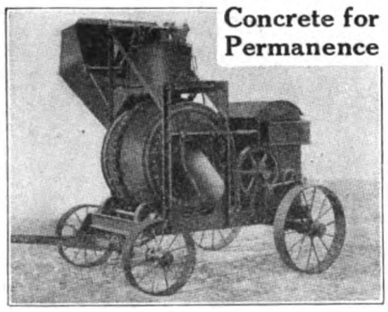

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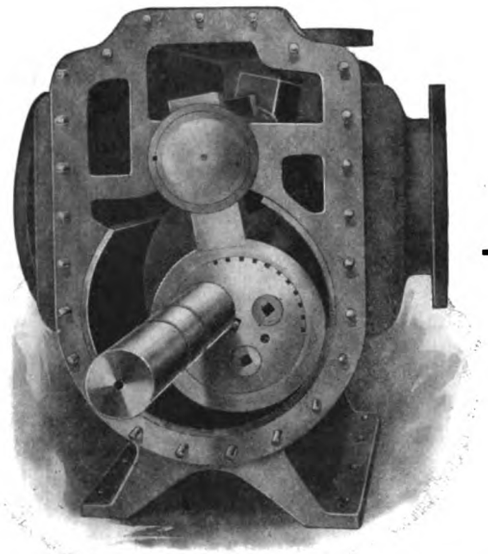

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Divides
Multiplies
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Friant, (near Fresno)

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We Guarantee Less Than 25% Voids

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Leading Manufacturers and Dealers in Machinery, Supplies and Instruments. If you do not find what you want here, write us and we will give you the names of competent and reliable dealers.

FOR ADDRESSES SEE DIRECTORY ON PAGE 26

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Fairchild-Gilmore-Wilton Co.
Standard Oil Co.
Worswick Street Paving Co.

Asphalt Plants
Austin-Western Road Machy. Co.
Bacon & Co., Edward R.
Harron, Rickard & McCone
Kinney Manufacturing Co.
Young Machinery Co., A. L.

Auto Trucks
Kinney Manufacturing Co.

Automobile Trucking
Holland, J. P.

Belting
Gutta Percha & Rubber Mfg. Co.
Harron, Rickard & McCone
N. Y. Belting & Packing Co.

Blasting Supplies
California Trojan Powder Co.

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Ingersoll-Rand Company

Boilers
Moore & Co., Chas. C., Engineers

Books, Technical
Mining and Scientific Press

Briquetting Machinery
Meese & Gottfried Company

Brushes, Motor, and Generator
General Electric Co.
Westinghouse Electric & Mfg. Co.

Buckets
Blaw-Knox Company
Harron, Rickard & McCone
Meese & Gottfried Company

Buckets, Concrete
Harron, Rickard & McCone
Kilbourne & Jacobs Mfg. Co.

Calculating Machines
Monroe Calculating Machine Co.

Carriers
Browning Co., The

Cars, Contractors'
Harron, Rickard & McCone
Kilbourne & Jacobs Mfg. Co.

Cars, Dump
Harron, Rickard & McCone
Kilbourne & Jacobs Mfg. Co.

Carts, Concrete
Harron, Rickard & McCone
Kilbourne & Jacobs Mfg. Co.

Cement, Portland
Cowell Lime & Cement Co., Henry
Riverside Portland Cement Co.
Santa Cruz Portland Cement Co.
Standard Portland Cement Corp.

Chain
Meese & Gottfried Company

Chains, Transmission
(See 'Transmission Machinery')

Coal Handling Machinery
Meese & Gottfried Company

Compressors, Air
Doak Gas Engine Company
Ingersoll-Rand Company
Moore & Co., Chas. C., Engineers
Sullivan Machinery Co.

Concrete Forms, Steel
Blaw-Knox Company

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Enterprise Electric Co.
Foote Mfg. Co.
Harron, Rickard & McCone
Jaeger Machine Co.
Young Machinery Co., A. L.

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Brady & Flinn
Brush-Howard Co.
Columbia Construction Co.
Daniel Contracting Co.
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Municipal Engr. & Contr. Co.
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Meese & Gottfried Company

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California Corrugated Culvert Co.
Coast Culvert & Flume Co.
Nevada Metal Mfg. Co.
Spokane Corrugated Culvert & Tank Co.
Western Pipe & Steel Co.

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California Curb Bar Co.

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Harron, Rickard & McCone

Ditch Diggers
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Browning Co., The
Buckeye Traction Ditcher Co.
Harron, Rickard & McCone
Young Machinery Co., A. L.

Dragline Excavators
Harron, Rickard & McCone
Meese & Gottfried Company
Stockton Iron Works

Dredges, Dipper
Yuba Manufacturing Co., The

Dredging Machinery
Stockton Iron Works
Yuba Manufacturing Co., The

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Sullivan Machinery Co.

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Westinghouse Electric & Mfg. Co.

Engine-Generators, Gasoline
Doak Gas Engine Company
General Electric Co.

Engines, Oil
Doak Gas Engine Company

Engines, Steam
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Armco Iron Culvert & Flume Mfrs. Assoc.
California Corrugated Culvert Co.
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Kinney Manufacturing Co.
Tiffin Wagon Company

Forms, Steel Concrete
Blaw-Knox Company

Gears
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Meese & Gottfried Company

Gears, Silent
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Westinghouse Electric & Mfg. Co.

Generators, Electric
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Westinghouse Electric & Mfg. Co.

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Grant Rock & Gravel Co.
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Browning Co., The
Doak Gas Engine Company
Harron, Rickard & McCone

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Sullivan Machinery Co.

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Harron, Rickard & McCone
N. Y. Belting & Packing Co.

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Doak Gas Engine Company

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General Electric Co.
Westinghouse Electric & Mfg. Co.

Locomotives, Electric
General Electric Co.
Westinghouse Electric & Mfg. Co.

Locomotive Cranes, Steam
Browning Co., The
Harron, Rickard & McCone

Meters, Oil, Steam, Water, and Gas
General Electric Co.

Motors
General Electric Co.
Westinghouse Electric & Mfg. Co.

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Harron, Rickard & McCone

Paving Materials
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Grant Gravel Co.
Grant Rock & Gravel Co.
Riverside Portland Cement Co.
Santa Cruz Portland Cement Co.
Standard Oil Co.
Worswick Street Paving Co.

Pipe, Genuine Iron Wrought
Woods, Huddart & Gunn

Pipe, Riveted Steel and Iron
Sacramento Pipe Works
Western Pipe & Steel Co.
Woods, Huddart & Gunn

Pipe Specials
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Pipe, Wood
Redwood Manufacturers Co.

Pneumatic Hose
Gutta Percha & Rubber Mfg. Co
N. Y. Belting & Packing Co.

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California Trojan Powder Co.

Power Plants
Doak Gas Engine Company
General Electric Co.
Moore & Co., Chas. C., Engineers
Westinghouse Electric & Mfg. Co.

Protective Paints
Standard Oil Co.

Pulleys, Shafting and Hangers
(See 'Transmission Machy.')

Pumps
American Well Works
Doak Gas Engine Company
Ingersoll-Rand Company
Jackson Iron Works, Byron
Kinney Manufacturing Co.
Sullivan Machinery Co.
Yuba Manufacturing Co., The

Railroads
Oakland, Antioch & Eastern R. R. Co.
Southern Pacific Co.

Railway Supplies and Equipment
Harron, Rickard & McCone

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Woods, Huddart & Gunn

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Enterprise Electric Works
Palmer & McBryde

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Austin-Western Road Machy. Co.
Bacon & Co., Edward R.
Browning Co., The
Harron, Rickard & McCone
Kinney Manufacturing Co.
Young Machinery Co., A. L.
Yuba Manufacturing Co., The

Road Oils
Standard Oil Co.

Road Rollers
Austin-Western Road Machy. Co.
Bacon & Co., Edward R.
Erie Machine Shops
Young Machinery Co., A. L.

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Harron, Rickard & McCone

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Meese & Gottfried Company

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Rubber Goods
N. Y. Belting & Packing Co.

Safety Appliances
General Electric Co.

Saw Mill Machinery
Harron, Rickard & McCone
Meese & Gottfried Company

Screens
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Meese & Gottfried Company

Second-Hand Equipment
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Harron, Rickard & McCone
Young Machinery Co., A. L.

Sewer Pipe
Armco Iron Culvert & Flume Mfrs. Assoc.
Redwood Manufacturers Co.

Shafting
(See 'Transmission Machy.')

Shoes and Dies
Harron, Rickard & McCone

Shovels, Steam
Browning Co., The
Harron, Rickard & McCone

Sprinklers, Street
Kinney Manufacturing Co.
Tiffin Wagon Company

Steel, Drill and Sheet
Blaw-Knox Company
Carnegie Steel Co.
Sacramento Pipe Works
Western Pipe & Steel Co.

Suction Dredges
Yuba Manufacturing Co., The

Tampers, Power
Bacon & Co., Edward R.

Tanks, Wood
Redwood Manufacturers Co.

Tractors
Yuba Manufacturing Co., The

Transmission Machinery
Doak Gas Engine Company
Harron, Rickard & McCone
Meese & Gottfried Company
Platt Iron Works Co.

Turbines, Hydraulic
Platt Iron Works Co.

Turbines, Steam
General Electric Co.
Moore & Co., Chas. C., Engineers
Westinghouse Electric & Mfg. Co.

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Chapman Valve Mfg. Co.
Kennedy Valve Mfg. Co.
Western Pipe & Steel Co.

Wagons, Dump
Austin-Western Road Machy. Co.
Bacon & Co., Edward R.
Tiffin Wagon Company
Troy Wagon Works

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Redwood Manufacturers Co.
Sacramento Pipe Works
Western Pipe & Steel Co.

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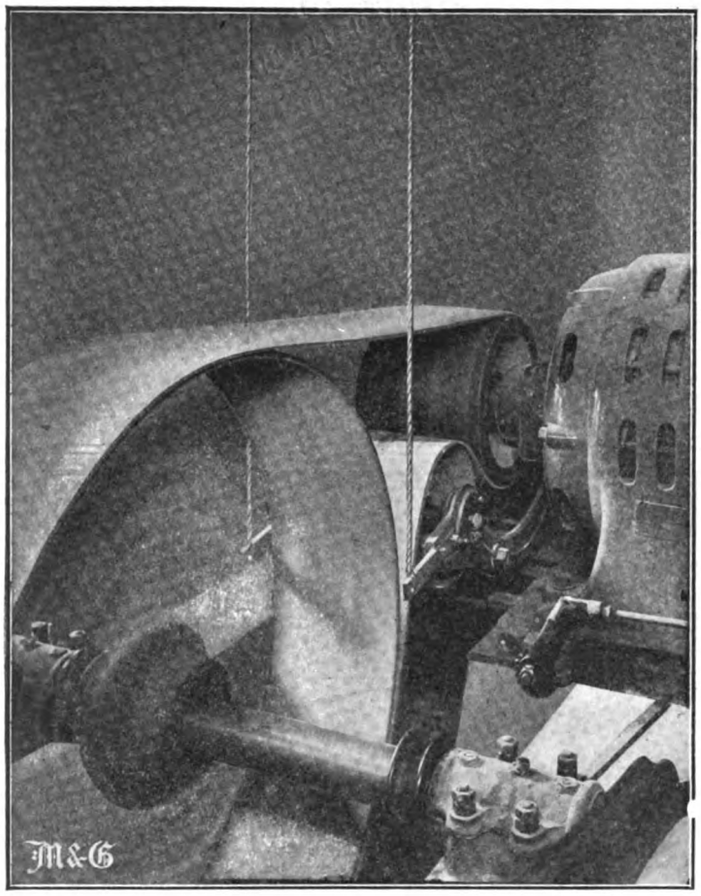

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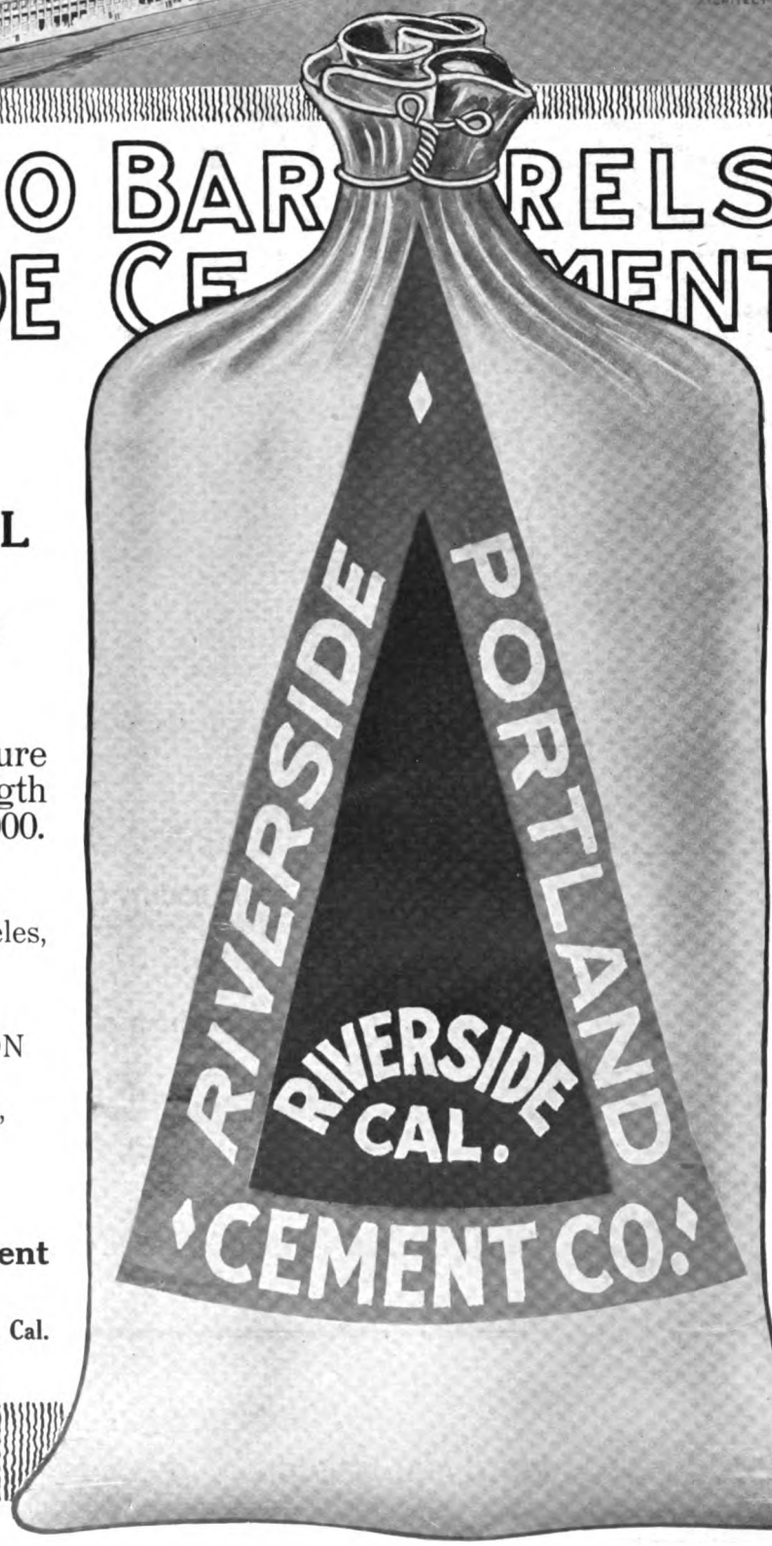

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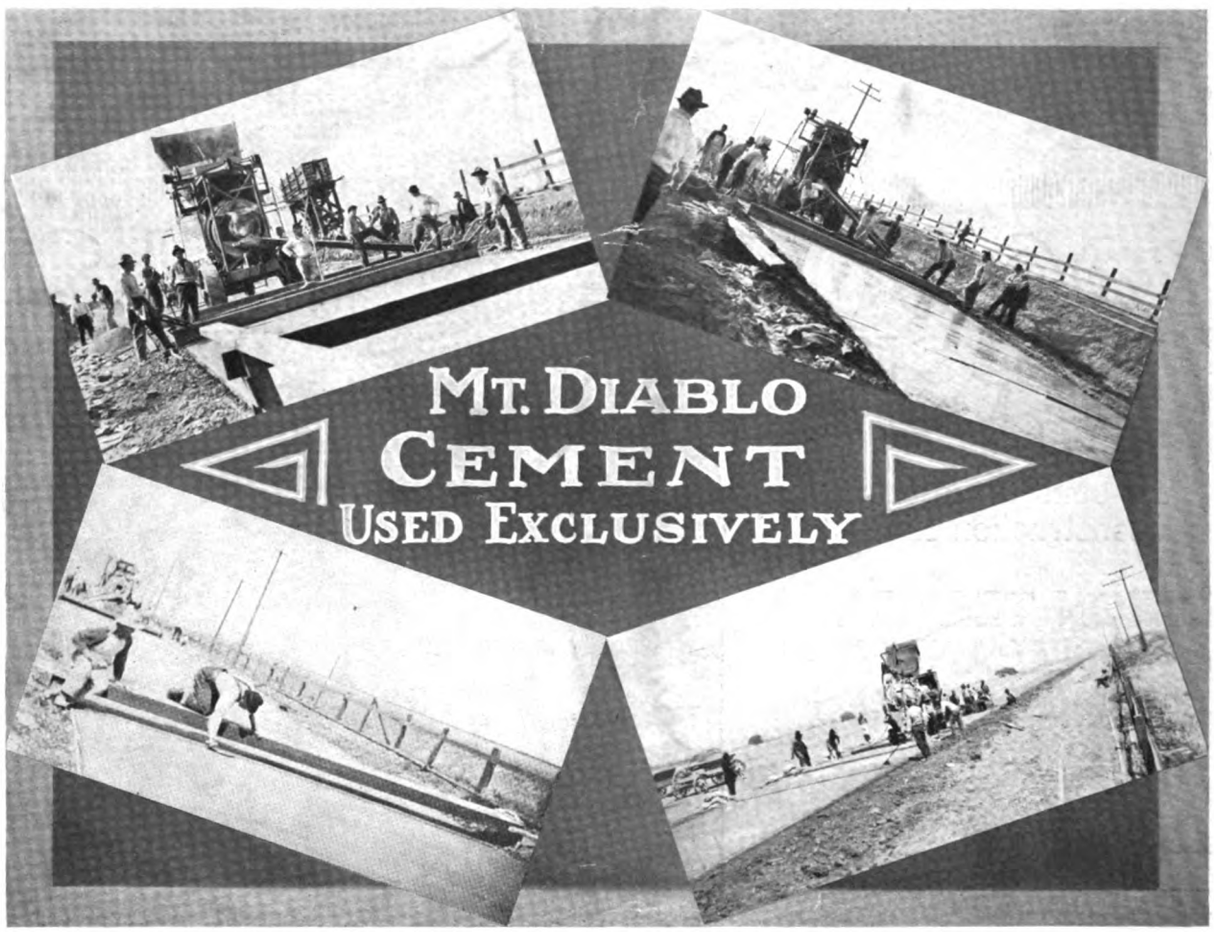
No. 2 Market Street San Francisco, California



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